9-1975

Fareless Square

Betty Barker

Sally Campbell

Mike Kyte

Sharon Goodmonson

Dara Hoerman

Free Fare Zone
General Info.

FARELESS SQUARE

Consultants:

Yaden/Associates
Johnson-Lenz

Tri-Met Staff:

Betty Barker
Sally Campbell
Mike Kyte
Sharon Goodmonson/Dara Hoerman

September, 1975

SUMMARY

Fareless Square has increased the mobility of workers, shoppers, and students in downtown Portland, particularly during the middle of the day.

- Nearly half the passengers surveyed said they were using the bus more often than before. Fareless Square was the second most important reason for increased bus travel.

- Bus trips from work to shopping on the lines surveyed in Fareless Square have increased nearly five times during the midday, from 2.3 percent to 11 percent. Trips from one store to another also increased from 1 percent to 5.6 percent during the midday.

- More downtown workers are using the bus to travel to other offices and appointments, an increase from 1.4 percent to 4.1 percent.

Tri-Met is serving more people for a greater variety of purposes. Shopping has become the second most popular destination since bus service became free downtown.

- The percentage of passengers surveyed whose main purpose for using Tri-Met was commuting to work decreased from 64.6 percent to 58 percent. The percentage for all other categories (shopping, school, other) increased from 35.5 percent to 42 percent.

- Approximately 11,000 passengers on the 20 bus lines surveyed in May, 1975, were going to or returning from shopping.

Tri-Met has not lost revenue because of the free service downtown.

- The heaviest increase of trips on the lines surveyed occurred from 11 a.m. to 2 p.m., when buses are less crowded and more seats are available. One-fifth of the midday bus riders surveyed downtown were traveling within Fareless Square.

- Elimination of the Shopper Bus service which previously served the downtown area has freed two buses for other service, saving $22,000 per year.

Bus operators who were interviewed about the free service generally approved of it. The major problem remaining is the requirement that passengers pay as they leave the bus on outbound trips, causing confusion for first-time riders and delays on crowded buses.

While there are no measurable reductions in air pollution or traffic in Fareless Square which can be directly attributed to free downtown bus service, it does appear that the Portland Transportation Control Strategy is having an effect. This Strategy includes improved public transit, park and ride lots, and the downtown parking and circulation plan.

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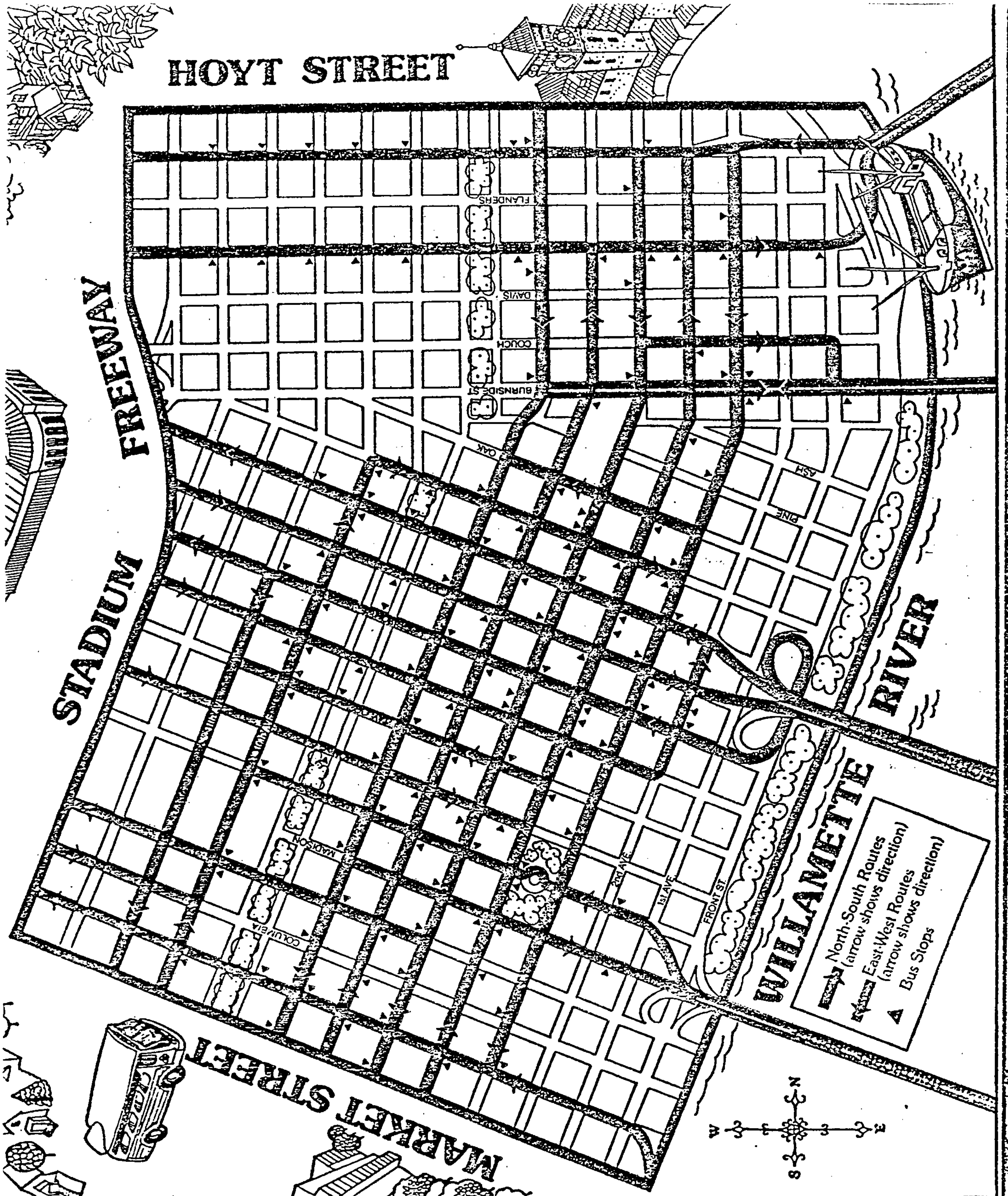
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II. INTRODUCTION

On January 12, 1975, Tri-Met launched a cluster of new services and programs. The new flat fare enabled passengers to ride anywhere in the district for 35 cents, a boon for suburban commuters, some of whom had paid 75 cents a ride before. Monthly passes went on sale, entitling passengers to take unlimited trips for $13. The major portion of downtown Portland became Fareless Square, where anyone could ride free with Tri-Met.

These programs have had a significant effect on Tri-Met ridership. Tri-Met carried nearly 23 million riders in the fiscal year ending June 30, 1975, an increase of 11.6 percent over the previous year.

Expected Benefits of Fareless Square

As part of the Portland Clean Air Plan, Tri-Met made a commitment to reduce traffic and air pollution within the downtown Portland area by providing an attractive alternative to the private automobile. Other potential benefits were listed in the Tri-Met Free Downtown Fare Proposal:

- People who were introduced to public transit by using Fareless Square service for short trips would try it for longer trips.
- Coordination between businesses and offices would be more easily achieved. More business trips would be made by bus.
- Free bus service would encourage people to make use of opportunities for shopping, eating out, and handling personal business downtown.

Boundaries of Fareless Square

Fareless Square extends from the Willamette River west to the Stadium Freeway, and from Market Street on the south to Hoyt Street on the north, encompassing 280 city blocks. Within the boundaries are the major business, banking, shopping and entertainment districts of the Portland metropolitan area; City, County, and Federal buildings; medical and dental facilities; schools and colleges; the area's major public library; churches; two museums; and Old Town, where craftsmanship and enthusiasm for a revived historical district have renewed commercial activity. Just beyond the southern boundary of Fareless Square are the City's major educational institution, Portland State University, several government offices, and the South Auditorium Renewal Project (Portland Center), containing office buildings, shops, and high-rise residential buildings.

Fare Collection Procedures for Fareless Square

Fareless Square required a new procedure for collecting fares, based on Seattle's "Magic Carpet" plan. An extensive program of re-education was carried out by media, "Rider Reminders", and posters on buses. Passengers riding to Fareless Square pay as they board. No fares are collected while a bus is in Fareless Square. Passengers boarding in Fareless Square pay as they leave the bus outside the boundary. Those passengers who board a bus going to Fareless Square and ride through to a destination on the other side pay as they board and request a transfer. They present the transfer to the bus operator as they leave, and so avoid paying twice.

Evaluation of Fareless Square

Several projects were planned well in advance to evaluate the impact of Fareless Square:

- Passengers were to be surveyed before the service went into effect and again several months after it was inaugurated, to determine changes in riders' use of buses downtown.
- Bus operators would be interviewed to assess the effect on day-to-day operations.
- The City of Portland would provide traffic counts before and after Fareless Square service.
- The State of Oregon Department of Environmental Quality would provide data on air pollution before and after Fareless Square.

III. SURVEYS OF TRI-MET PASSENGERS JANUARY 9, and MAY 22, 1975

Tri-Met staff and consultants selected 20 bus lines that provided the best service within Fareless Square in January. Based on recent driver counts, these lines carry approximately 75 percent of the total riders on all lines serving downtown Portland. Selected trips were surveyed from 7 a.m. to 6 p.m. A Tri-Met employee boarded the assigned bus at the last stop before Fareless Square and handed out surveys to all passengers on the bus at that point and to all who entered the bus until the final stop in Fareless Square. Survey forms and methods are shown in Appendices A and B.

The first survey, on Thursday, January 9, 1975, was meant to measure actual use of buses before Fareless Square service began. Every 13th trip on each of the 20 lines selected was surveyed. Of all the passengers on the 79 bus trips surveyed and analyzed, 39 percent, or 1397 passengers, returned a usable survey.

The second survey was done on Thursday, May 22, to measure changes in bus use as a result of Fareless Square service. Every 16th trip was surveyed on the same 20 bus lines. Of the passengers on the 77 bus trips analyzed, 45 percent, or 1602, returned a usable survey.

The population of riders surveyed in January and May remained approximately the same, so it is meaningful to compare percentages of the ridership between the two surveys without reference to the actual numbers of riders. The total population of passenger trips on the 20 lines surveyed in January was estimated at 59,353. The total population in May was estimated at 60,111. (See Appendix B.)

The changes over time revealed by the two surveys may have been affected by several factors. It is important to keep these factors in mind when examining the survey results:

- Weather conditions
- Time of year
- Sales in retail stores (post-Christmas and inventory sales in January)
- The general state of the economy
- Demographics (shifts in population age, sex, income, etc.)
- Changes in Tri-Met service and the public's image of Tri-Met

Travel Within Fareless Square

Approximately 5,000 trips were made within Fareless Square in May on the 20 lines surveyed--8.3 percent of the trips. This was a slight increase over the trips made in January--7.7 percent.

The greatest increase was in the time period from 11:00 a.m. to 2:00 p.m. Before Fareless Square, 11.1 percent of the midday bus passengers surveyed were riding exclusively within the boundaries of the future Fareless Square. In May, 19.4 percent, or one in five passengers, were doing so. (See Appendix C, Table 1.)

Purpose of Bus Use

The percentage of surveyed passengers who stated that their main purpose for using the bus to or through downtown Portland was travel between work and home decreased from 64.6 percent in January to 58 percent in May. Other purposes gained in proportion. The percentage who used the bus primarily for work-related purposes (traveling between offices, delivering goods) rose from 1.4 percent to 4.1 percent. The percentage using the bus for school, shopping, and other purposes increased from 34 percent to 38 percent. (See Appendix C, Table 2.)

Origins and Destinations

The origins and destinations recorded on the surveys differed from the stated purposes. In January, 15 percent of the passengers surveyed said that their main purpose was travel between home and school; in May, 20.5 percent said so. However, in the tabulation of origins and destinations, the percentage of trips between school and home dropped from 15.6 to 13.0 percent.

The reverse occurred with shopping trips: although shopping dropped as a main purpose, from 14.6 percent to 9.1 percent, actual shopping trips increased from 13.9 percent to 19 percent (Appendix C, Table 3).

On the lines surveyed, shopping now appears to be the most important "second purpose" for riding the bus since Fareless Square service began. Passengers use the bus primarily for travel to work or school; they also use the bus to shop downtown.

Increase of Bus Use

In May, 69.3 percent of the passengers surveyed were riding the bus five days a week or more, an increase of 4 percent since January. The largest increase was from 9 a.m. to 11 a.m., followed by 11 a.m. to 2 p.m. Passengers in the second survey were asked if they were riding the bus more often, less often, or the same as in January. A large percentage, 42 percent,

said they rode more often, while only 1.9 percent said they rode less often. The largest gain was in the time period from 11 a.m. to 2 p.m., when over half the passengers, 51.3 percent, stated that they rode more often. (See Appendix C, Tables 4 and 5.)

Reasons for Increased Bus Use

Passengers in the second survey who said that they rode the bus more often were asked which of Tri-Met's new programs and services was most responsible for this increase. Ranked in popularity were the monthly pass (35.1 percent), Fareless Square (27.2 percent), the 35-cent flat fare (18.7 percent), improved service, including more runs, new routes, and express runs (18.3 percent), and Park and Ride lots (0.7 percent).

The monthly pass was strongest during commuting hours, while Fareless Square showed its drawing power from 9 a.m. to 2 p.m. (See Appendix C, Table 6.)

A cautionary note is necessary. Since most of the lines surveyed primarily serve the City of Portland rather than the suburban areas, the flat fare would not have a major impact on their ridership.

Surveyed Rider Characteristics: Sex and Age

The proportion of male and female passengers did not change from January to May on the 20 lines surveyed. In January 66 percent of the passengers surveyed were women; in May 65.3 percent. There was a slight change in the age distribution. A greater proportion of the riders in May were under 18 (an increase of 3.3 percent), and a smaller proportion were over 60 (a decrease of 3 percent). Other age groups were stable. Nearly 40 percent in both surveys were young adults (18-29). (See Appendix C, Table 7.)

Surveyed Rider Characteristics: Availability of Car for this Trip.

A greater proportion of the passengers surveyed in May did not have a car available for their trip that day. In January, 50.3 percent did not have a car; in May this increased to 59 percent. Because other factors such as sex and age were fairly stable, it is difficult to find explanations for this increase. Both men and women were less likely to have a car available, with shifts of 9 percent and 10 percent. The change seems most dramatic for men: in January nearly 60 percent of the men stated that they had cars available; in May just over half did not. The only age group which showed an increase in car availability was that under 18. However, this age group was still the most dependent on public transit: only 23 percent could have used a car for the trip surveyed. (See Appendix C, Tables 8, 9, 10.)

Again, since the lines surveyed do not primarily serve the suburban population, which has different characteristics than the City's population, it is not possible to draw inferences about all Fareless Square riders from the survey results.

IV. INTERVIEWS WITH BUS OPERATORS

The effect of Fareless Square on daily operations was evaluated by personal interviews with bus operators. One operator was randomly selected from each of the 20 bus lines surveyed.

The majority of the operators interviewed believed that Fareless Square service worked well for passengers. They saw benefits for downtown workers, who could shop during their lunch hour or travel to appointments or meetings by bus, and for older passengers who could more easily move from one section of the downtown area to another. These benefits appeared to outweigh the disadvantages of requiring passengers to pay as they left a bus traveling away from Fareless Square.

Some operators believed that their schedules were not affected by Fareless Square because they could load passengers faster in the downtown area. Nearly as many operators, however, felt that the new fare collection procedure created delays because they carried more passengers downtown and because passengers on outbound trips were forced to push past standees to get to the front of the bus.

There appeared to be some problems caused by the boundaries of Fareless Square. Passengers leaving the bus at Union Station were usually surprised to learn that this stop was not included in Fareless Square and had to search for change. The Market Street boundary of Fareless Square is confusing to passengers who consider Portland State University and Portland Center to be part of the downtown.

V. TRAFFIC AND AIR POLLUTION IN FARELESS SQUARE

Traffic

The City of Portland Bureau of Traffic Engineering has monitored traffic in Portland's Central Business District since 1971. Since mid-November, 1974, the Bureau has also measured traffic in the area bounded by Stark, Broadway, Yamhill, and Fourth to assess the effect of Fareless Square. The period from mid-November, 1974, to January, 1975, was the baseline for comparison with traffic volumes after Fareless Square service began in January.

Traffic volumes both in the Central Business District and Fareless Square dropped two to four percent during January to May, 1975, from the base period of November, 1974-January, 1975. However, this does not appear to be a statistically significant reduction, since it follows the usual seasonal trend. Historically, traffic volumes dip in January from the previous two months and rise slowly through February and March to a peak in April.

There has been a general decrease in traffic since the high of 1971, with a sharp dip in January and February, 1974, the period of intense gas shortages. Future traffic counts may show further reductions. It does appear that the Portland Transportation Control strategy and economic factors are having a cumulative effect on downtown traffic. The strategy includes improved transit, Fareless Square service, park and ride lots, and the downtown parking and circulation plan.

Air Pollution

The Department of Environmental Quality monitors the air quality of the downtown area at two stations, on Seventh and West Burnside and SW Fourth and Alder. A level of carbon monoxide in excess of 10 mg/m^3 is a violation of the eight-hour ambient air standard, and is supposed not to occur more than once a year after May 31, 1976. Numerous violations of the eight-hour carbon monoxide standard have occurred in Portland, but there has been a steady reduction since 1972. From January to May, 1972, there were 55 violations at the Continuous Air Monitor (CAM) station on Seventh and West Burnside. For the same time period, the number decreased to 43 in 1973, 28 in 1974, and 19 in 1975.

The Federal Motor Vehicle Emission Control Program and the Transportation Control Strategy have apparently led to significant improvement in air quality over the past several years.

The few minutes it takes you to complete this questionnaire will help Tri-Met improve service. Please drop it in any mailbox today. Thank you!

1A. Where did you start <u>this</u> bus trip?

- ☐ Home
- ☐ Work
- ☐ School
- ☐ Shopping or personal business
- ☐ Other

1B. Where will you end <u>this</u> bus trip?

- ☐ Home
- ☐ Work
- ☐ School
- ☐ Shopping or personal business
- ☐ Other

2A. Where did you get <u>on</u> this bus?

- ☐ Inside Fareless Square (Outlined area on map)
- ☐ Outside Fareless Square

2B. Where will you get <u>off</u> this bus?

- ☐ Inside Fareless Square
- ☐ Outside Fareless Square

3. On the average, how many days each week do you travel BY BUS <u>to</u> <u>or</u> through Fareless Square?

☐ 1 2 3 4 5 or more

4. Was a car available to you today for making this trip?

☐ Yes ☐ No

5. What is the main purpose for which you use the bus for travel <u>to</u> <u>or</u> <u>through</u> Fareless Square? Check only one.

- ☐ Travel between work and home
- ☐ Travel related to work (not commuting)
- ☐ Travel between school and home
- ☐ Shopping or personal errands
- ☐ Other

On January 12, Tri-Met began several new programs and services. We would like to know how effective these changes have been.

6. Compared to five months ago (before January 12), do you now travel <u>to</u> <u>or</u> <u>through</u> Fareless Square BY BUS more or less often than you did before?

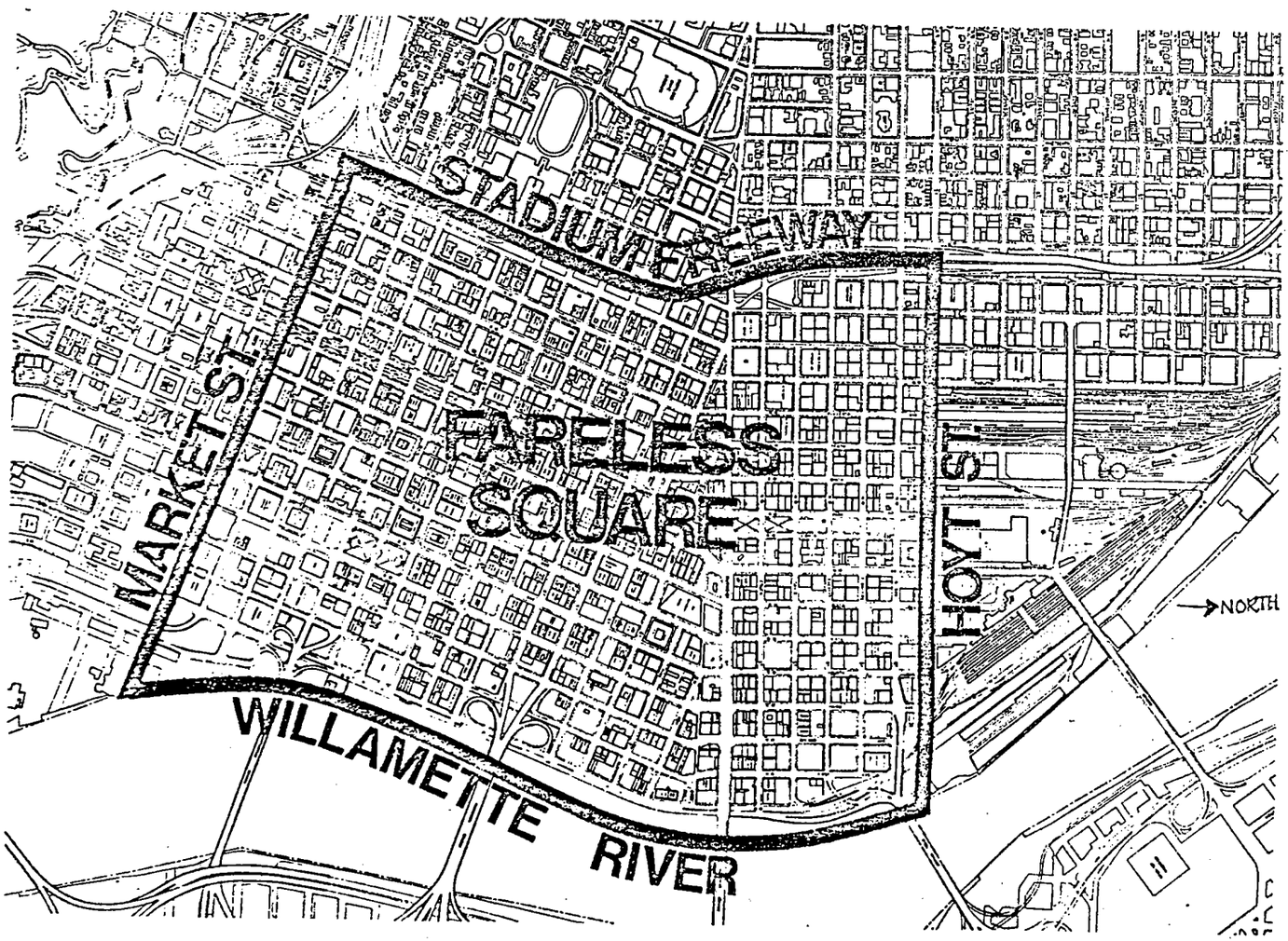
- ☐ More often
- ☐ About the same
- ☐ Less often

7. Please answer this question only if you checked "More often" in Question 6.

Which of the following is the most important reason for your using the bus more often than you did before January 12? Check one only.

- ☐ Flat fare (35¢ from all areas)
- ☐ Fareless Square (free bus downtown)
- ☐ Improved bus service (more runs, more routes, express runs)
- ☐ Park and Ride Lots
- ☐ Monthly pass ($13 for unlimited use)

PLEASE TURN TO BACK FLAP.



The two minutes it takes you to complete this questionnaire will help Tri-Met improve service. Please drop it in any mailbox today. Thank you!

1. Where did you start this bus trip, and where will it end?

	Start	End
Home	☐	☐
Work	☐	☐
School	☐	☐
Shopping (store) or personal business	☐	☐
Other	☐	☐

2A. Where did you get on the bus?

☐ (A) Inside outlined area
☐ (B) Outside outlined area

2B. Where will you get off the bus?

☐ (A) Inside outlined area
☐ (B) Outside outlined area

3A. On the average, how many days each week do you travel, by any means, to or through the outlined area (A) of the map?

☐1 ☐2 ☐3 ☐4 ☐5 or more

3B. On the average, how many days each week do you travel BY BUS to or through the outlined area (A) of the map?

☐1 ☐2 ☐3 ☐4 ☐5 or more

4. What is the main purpose for which you use the bus for travel to or through the outlined area (A) of the map?

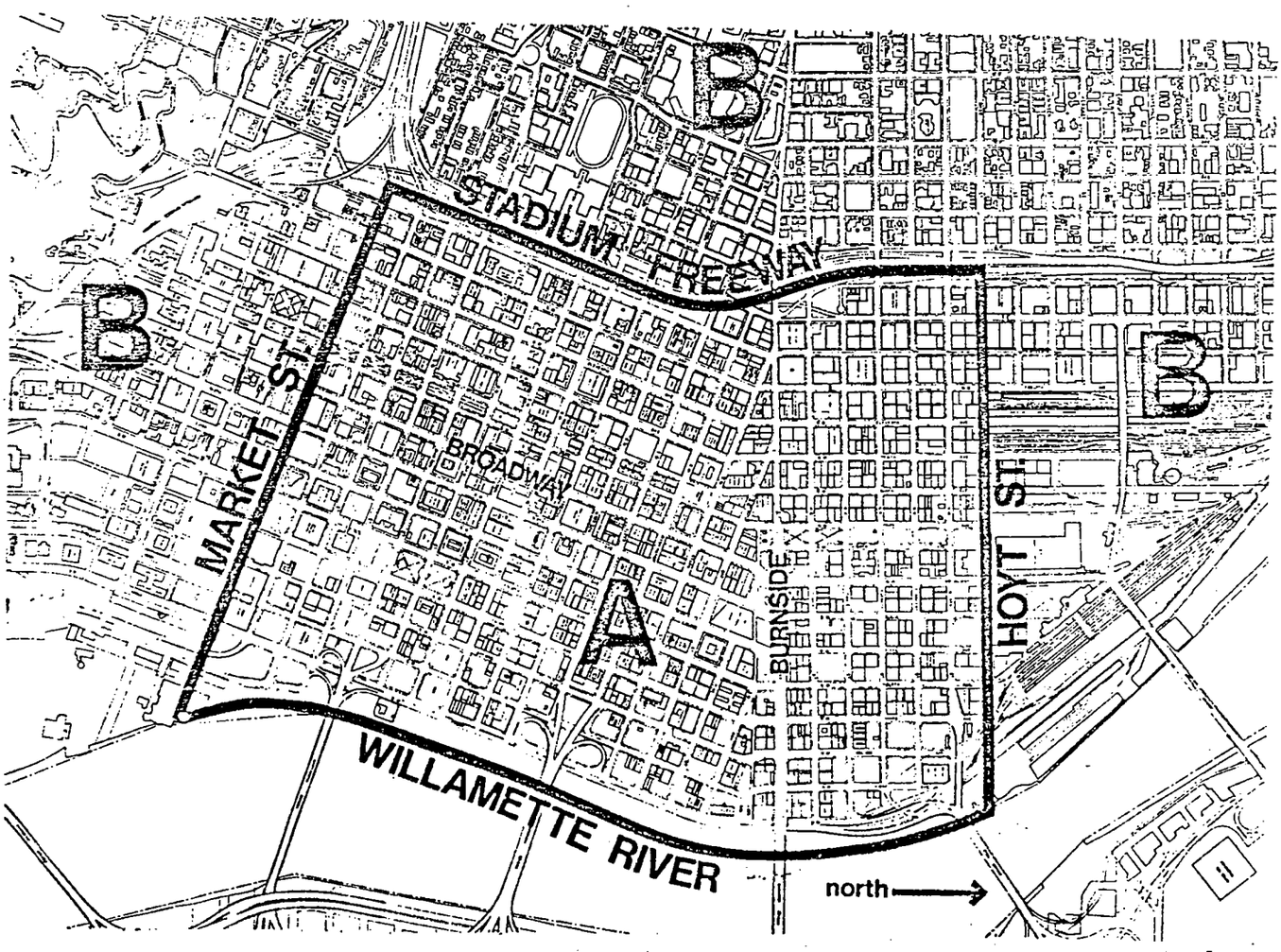
☐ Travel between work and home
☐ Travel related to work (not commuting)
☐ Travel between school and home
☐ Shopping or personal errands
☐ Other

5. Was a car available to you today for making this trip?

☐ Yes ☐ No

6. Sex: ☐ Male ☐ Female

7. Age: ☐ Under 18 ☐ 18 - 29 ☐ 30 - 44 ☐ 45 - 59 ☐ 60 and over



Appendix B
Survey Methodology

JOHNSON-LENZ
695 Fifth Street
Lake Oswego, Oregon 97034
(503) 635-2615

July 20, 1975

To: Betty Barker, Tri-Met Planning Department
From: Peter and Trudy Johnson-Lenz
Re: Sampling Method and Weighting Procedure for the Fareless Square Surveys

This memo summarizes the reasoning used in designing the January and May Fareless Square surveys. The original survey design, developed by Yaden/Associates, was to study Fareless Square and to "measure changes of certain behavior over time, not to estimate characteristics of ridership." (Yaden memo of 5/6/75) Consistent sampling and analysis must be maintained from one survey to the next to permit comparisons between the two surveys so that changes over time can be estimated. In particular, since the survey was designed to study any changes in Fareless Square ridership, within separate time zones as well as for the entire time period under study, it is important that each time zone in each survey be fairly represented. The weighting procedure described below was created to correct for any imbalance in representation that may have appeared during the data collection.

References are made in this memo to David Yaden's memo of May 6, 1975 and to Johnson-Lenz's memo of July 14, 1975. For a more complete discussion of the development of the sampling for the first survey, see the Yaden memo. For a discussion of estimates of the population of riders, see the Johnson-Lenz memo.

The Population

Certain lines were selected from among all those that touch the Fareless Square at some point. Those lines that did not have a significant impact on the Square were not included. Each of the selected lines involved many trips each day. The entire set of all trips that left Fareless Square on a weekday between 7 AM and 6 PM was chosen to be the population of trips from which the sample was taken. This population included outbound trips from the garage, as well as those trips that entered the Square from the outside. Each of the buses in this population of trips carried many riders. The entire set of riders carried by all the buses in the population of trips was the population or riders sampled in the survey.

Since it is impossible to survey the entire population of riders, we can sample from among them, and then infer from the survey of that sample what is happening in the whole population. Since it is simpler to design a sampling procedure for the trips than for the riders, and since a sampling of the trips is also a sampling of the riders, we can effectively sample the population of riders by sampling bus trips.

The Sample

The sampling ratio is the ratio of the number of trips in the sample to the number of trips in the population. The initial sampling ratio of 1/13 was chosen so that a reasonably sized sample could be taken without excessive cost. The stack of schedules for the population of trips was sorted from lowest line number to highest. Using tables, a random number between 1 and 13 was selected, which became the index of the first run to be sampled. For example, if the random number had been 7, then the seventh run of the first schedule would be the first run in the sample. From then on, every 13th run was chosen for the sample. This sampling procedure was continued directly

into each successive schedule in the stack without restarting the count at each new schedule. That is, all the inbound schedules were regarded as one long continuous schedule. Only the inbound schedules were included, but the computer analysis and the computations below were adjusted to reflect the additional outbound runs from the garage on the assumption that they would experience the same traffic and load as those not coming from the garage. Each trip was assigned a time zone according to the time of the last stop within the Fareless Square. Any trips falling exactly on the hour dividing time zones was assigned to the next time zone.

The resulting sample of trips was then surveyed. Each bus was boarded by a Tri-Met staff member as it entered the Fareless Square, and all passengers on the bus were offered a survey form. Furthermore, as the bus passed through Fareless Square, the staff member offered a form to each additional boarding passenger. It is essential to the experimental design that each bus in the sample of trips be completely canvassed, that all passengers on each bus be offered a survey form. Such a canvassing assures that a sample of trips will produce a meaningful sampling of the riders on those buses. All those riders who then returned their questionnaires in a condition that could be included in the survey results comprised the sample of riders.

Table 1 shows certain basic facts about each of the two surveys.

Table 1

survey	population of trips	initial sample of trips	final sample of trips	initial sampling ratio	final sampling ratio	sample of riders	estimated population of riders
January	1309	87	79	1/13	1/16.57	1397	59,353
May	1370	81	77	1/16	1/17.79	1602	60,111

The final sample of trips for each survey was smaller than the initial sample because of zero response rates or problems in data collection that made the results uncertain. The initial sampling ratio of the second survey was set to a different value than the first survey for two reasons: 1) to reduce the number of staff members required to collect the data, and 2) to set the ratio for the second survey equal to the final sampling ratio of the first. The estimated population of riders is taken from Johnson-Lenz's memo dated July 14. The population of trips figures include trips outbound from the garage added in the two afternoon time zones. These numbers were computed by counting the inbound trips and then adding the outbound trips from the garage. These additional outbound garage trips were estimated by subtracting the number of inbound trips from the number of outbound trips on each schedule, both for loop routes and for pairs of connecting routes.

Weighting by Time Zones

After an initial analysis of the frequency of trips sampled within each time zone, it was clear that the sample did not represent each of the five time zones equally; some time zones were over-represented and some were under-represented. Table 2 shows the sampling ratios by time zone.

Table 2

survey	time zone	final sampling ratio	weight
January	7-9	1/24.69	1.56
	9-11	1/14.38	.88
	11-2	1/13.45	.84
	2-4	1/11.58	.71
	4-6	1/22.29	1.26
May	7-9	1/16.33	.926
	9-11	1/17.55	1.000
	11-2	1/15.39	.870
	2-4	1/25.44	1.417
	4-6	1/18.22	1.043

The weights for the January survey were provided by David Yaden using his method of computation and are taken from his May 6 memo. Johnson-Lenz computed the weights for the May survey according to Yaden's method. Johnson-Lenz has since discovered a simpler method for computing the weights. The methods are algebraically equivalent (see proof below) and differ only in the way one thinks about them and the exact sequence of computations involved in each.

The Yaden Weighting Method

According to Yaden, if the time zones are unfairly represented, we should weight each of them such that the trips sampled for the respective time zones constitute the same proportion of the sample as they do of the population. Table 3 below shows the weights for the first survey taken from Yaden's May 6 memo and includes all of his intermediate results.

Table 3

time zone	actual trips	sample trips	percent population	percent sample	weight
7-9	321	13	25	16	1.56
9-11	187	13	14	16	.88
11-2	269	20	21	25	.84
2-4	220	19	17	24	.71
4-6	312	14	24	19	1.26
	1309	79			

The percent population column is computed by dividing the actual trips in each time zone by the total number of trips. For instance, for time zone 7-9, 321/1309 = 25% and for the sample of trips in time zone 7-9, 13/79 = 16%. The weight column is computed by dividing the percent population column by the percent sample column. For instance, in time zone 7-9, 25/16 = 1.56. This seems reasonable, since time zone 7-9

represents a full quarter of the population but only 16 percent of the sample. The 16 percent needs to be increased by slightly more than half to become a representative 25 percent.

The Johnson-Lenz Weighting Method

Johnson-Lenz reasons that if the time zones are unfairly represented, we should weight each of them such that the sampling ratio is the same for all zones. In this way each time zone will be sampled at the same rate. Table 1 above provides us with the information needed to compute the weights. For instance, in the May survey, time zone 7-9 was sampled at a rate of 1/16.33, whereas the entire sample had a rate of 1/17.79. To correct for this imbalance, we compute a weight:

$$1/17.79 \div 1/16.33 = 16.33/17.79 = .918$$

which is nearly the same as the value computed by Yaden's method shown in Table 1 for zone 7-9 in the second survey, .926. In fact, if we were to carry the computations according to Yaden's method out to 4 digits of accuracy, we would obtain exactly the same result, .918, as with the Johnson-Lenz method.

Weighting by Each Run

Because the response rate varied so widely, it was decided that the response rate for each run should be standardized to .40 (the average response rate for the first survey). Therefore, for each different run in the sample of trips, a final weight was computed as follows:

$$\text{Weight for run} = (\text{time zone weight}) \times .4/(\text{actual response rate})$$

For example, given a run in the first survey in time zone 7-9 with a response rate of .60, the weight for the run would be: $1.56 \times .4/.6 = 1.04$.

Using the Weights

To avoid fractional parts of a respondent in the tabulated survey results for a weighted sample, the weights for each run were multiplied by 100. In this way, a run weight of 1.04 would become 104. Accordingly, a run weight of 1.00 (a weight which makes no correction or change) would become 100. Thus, each respondent in the sample of riders represents approximately 100 riders in the analysis, the exact number of riders being determined by the run weight times 100.

It should be stressed that the counts of riders in the various computer tabulations resulting from such a weighting are arbitrary figures and do not represent the actual numbers of riders in each category tabulated. These raw counts are used only to compute the percent figures in the tabulations. These percentages are very good estimates of the percentage of the population of riders in each category tabulated. To convert these percent figures to counts of riders, the estimated population of riders shown on page 2 should be used. Multiplying this estimated population of riders by the percentages drawn from the tabulations produces good estimates of the actual counts of riders in each category tabulated.

Conclusions

The sampling and weighting procedures described here provide an experimental design that can be used:

1. to estimate changes in Tri-Met Fareless Square ridership (increase or decrease in Fareless Square use)
2. to estimate changes in the characteristics of that ridership (more or less riders with a car available, for example)
3. to estimate the size of the population of riders that were surveyed (how many riders were on those lines that had significant impact on the Fareless Square)

This survey design cannot be used:

1. to estimate changes in Tri-Met ridership outside Fareless Square (increase or decrease in general Tri-Met ridership)
2. to estimate the actual characteristics of the Fareless Square ridership (how many riders to, through and from Fareless Square have a car, for example)
3. to estimate the size of the population of riders either to, through or from Fareless Square, or in the entire Tri-Met system.

For future studies, certain design changes may be made so that additional inferences are possible, such as some actual characteristics of the Fareless Square ridership, or the population of actual Fareless Square ridership. These changes can be made without jeopardizing the capacity to estimate changes over time.

Appendix C

Table I. Travel Within Fareless Square by Time Period (%)

Time	Get on and off in Square	
	January	May
All day	7.7	8.3
7-9	4.2	4.4
9-11	7.6	10.5
11-2	11.1	19.4
2-4	7.6	5.2
4-6	10.0	6.1

Table 2. Main Purpose for Which Passengers Use The Bus (% of passengers)

Main purpose for which you use the bus	January	May
Between work and home	64.6	58.0
Related to work, not commuting	1.4	4.1
Between school and home	15.0	20.5
Shopping, personal errands	14.6	9.1
Other	4.5	8.2

Table 3. Comparisons of Origin-Destination Combinations (% of trips)

Origin-Destination*	All Trips		Trips from 11-2	
	January	May	January	May
1. Home-Work Trips	60.7	53.6	26.0	17.3
2. Work-Work Trips	0.6	2.1	1.5	5.3
3. Home-School Trips	15.6	13.0	19.4	12.3
4. Home-Shopping Trips	10.6	12.6	28.8	30.5
5. Home-Other Trips	4.9	4.8	8.6	5.5
6. Work-Shopping Trips	1.8	3.1	2.3	11.0
7. Work-Other Trips	1.1	3.9	1.5	3.5
8. Shopping-Shopping	0.7	2.6	1.0	5.6
9. Work-School	1.1	0.8	4.2	2.2
10. School-Shopping	0.8	0.7	4.0	2.1
11. School-Other	0.4	1.5	0.3	1.5

*This includes trips in both directions. For example, (1), home-work includes trips from work to home.

Appendix C
(continued)

Table 4. Comparative Days by Bus per Week by Time Period (% of all trips in period)

Time	Five or more days by bus per week January	May
All	65.4	69.3
7-9	74.7	81.2
9-11	43.3	59.6
11-2	45.7	52.9
2-4	66.8	67.4
4-6	78.8	72.9

Table 5. Travel to Fareless Square by Bus More Often by Period (% of trips in period)

Time	More Often	About the Same	Less Often
All	42.0	56.2	1.9
7-9	39.7	59.7	0.6
9-11	44.9	53.3	1.8
11-2	51.3	46.9	1.8
2-4	33.1	63.6	3.4
4-6	42.8	55.0	2.2

Table 6. Reason for Using Bus More Often by Period (% of those riding more often)

Time	Fareless Square	Monthly Pass	Flat Fare	Improved Service	Park & Ride
All	27.2	35.1	18.7	18.3	0.7
7-9	24.0	36.8	21.9	16.3	1.0
9-11	34.3	34.1	13.6	18.0	-
11-2	33.1	29.0	19.9	17.3	0.7
2-4	16.9	36.2	25.3	21.6	-
4-6	28.0	38.1	13.5	19.4	1.0

Appendix C
(continued)

Table 7. Comparative Age Distribution

Age	% of Age Groups in Sample January	May
Under 18	4.9	8.2
18-29	38.9	38.6
30-44	17.6	17.8
45-59	20.5	20.3
60 and over	18.0	15.0

Table 8. Purpose of Bus Travel by Unavailability of Car for this Trip (% of passengers who had no car)

Purpose of Travel	Had No Car Available January	May
Between Work and Home	27.6	30.7
Related to Work	0.7	2.3
Between School and Home	10.4	14.5
Shopping, Personal Errands	8.1	6.0
Other	2.1	8.1
Total	48.8	58.6

Table 9. Car Availability by Sex (% of each sex in sample)

	Female		Male	
	January	May	January	May
Had car available for trip	45	36	59	49
No car available for trip	55	64	41	51

Table 10. Car Availability for This Trip by Age (% of each age group)

	Under 18		18-29		30-44		45-59		Over 60	
	Jan.	May	Jan.	May	Jan.	May	Jan.	May	Jan.	May
Had car available	14	23	45	37	64	53	57	48	46	39
No car available	86	77	55	63	36	47	43	52	54	61

Appendix C
(continued)

Table 11. Estimated Ridership of Lines Surveyed, January 9 and May 22, 1975

Time Zone	Estimated Ridership	
	January	May
All Day	59,353	60,111
7-9	17,826	16,412
9-11	7,478	6,792
11-2	9,980	10,188
2-4	9,982	10,685
4-6	14,087	16,034

Note: These are estimates of the total ridership to, through, or from Fareless Square on the days surveyed and on the lines included in the survey only. (Appendix C)

Robert W. Straub
GOVERNOR

DEPARTMENT OF
ENVIRONMENTAL QUALITY

1234 S.W. MORRISON STREET • PORTLAND, ORE. 97205 • Telephone (503) 229-5293

July 24, 1975

Ms. Betty Barker
Tri-Met
520 S. W. Yamhill
Portland, Oregon 97204

Dear Ms. Barker:

In response to your recent request, the following information related to carbon monoxide ambient air quality data at our CAM (7th and West Burnside) and S.W. 4th and Alder stations is being provided:

8-hour CO violations at CAM and S.W. 4th stations - 1972-1975

8-hour CO standard - 10 mg/m^3
Not to be exceeded more than once a year

CAMS

	1972	1973	1974	1975
January	15	14	8	10
February	15	10	6	6**
March	12	11	6	1**
April	10	4	6	1**
May	3	4	2	1**

S.W. 4th and Alder

	1972	1973	1974***	1975
January		16(1)*	4(4)*	2
February		16	4	7**
March		10(1)*	4(11)*	1**
April		8(1)*	6	1**
May		9	3	0**

*Days CO monitoring unit out of service.
**Tri-Met "Fareless Square" in operation.
***Sampling probe height changed from 7' to 12'.

While at first glance it would appear that the "Fareless Square" project has had a significant impact on reducing the number of 8-hour carbon monoxide violations at the above stations, it should be recognized that there are a number of elements within the Portland Transportation Control Strategy, e.g. Federal Motor Vehicle Emission Control Program, Downtown Parking and Circulation Plan, Park and Ride Stations, etc., as well as other economic factors which most likely have contributed to the decreased number of 8-hour violations. Considering all factors related to ambient carbon monoxide air quality, it does appear that the overall transportation control strategy for the Portland Downtown Area is being effective.

If I can be of any further assistance, please do not hesitate to contact me.

Sincerely,

LOREN KRAMER
Director

Carl A. Simons

Carl A. Simons
Technical Services
Air Quality Control

CAS:cs

cc: Portland Clean Air
Watchdog Committee

THE CITY OF
PORTLAND
OREGON

DEPT. OF FINANCE
AND ADMINISTRATION
NEIL GOLDSCHMIDT
MAYOR

BUREAU OF TRAFFIC
ENGINEERING
D.E. BERGSTROM
CITY TRAFFIC ENGINEER

420 S.W. MAIN ST.
PORTLAND, OR. 97204
503/248-4295

June 16, 1975

Ms. Betty Barker
Tri-Met
520 S.W. Yamhill Street
Portland, Oregon 97204

Dear Ms. Barker:

The enclosed graph "Traffic Counts from Computer Detectors" summarizes the results of our data gathering since January.

As can be seen there is a 2% reduction in volume since the base period. Since the base period was during the Christmas season this reduced volume is probably the normal volume.

In conclusion, there does not appear to be a statistically significant reduction in traffic volumes over this period.

If you have any further questions or would desire more data, contact Mike Thompson at 248-4199.

Sincerely,

James R Wilson

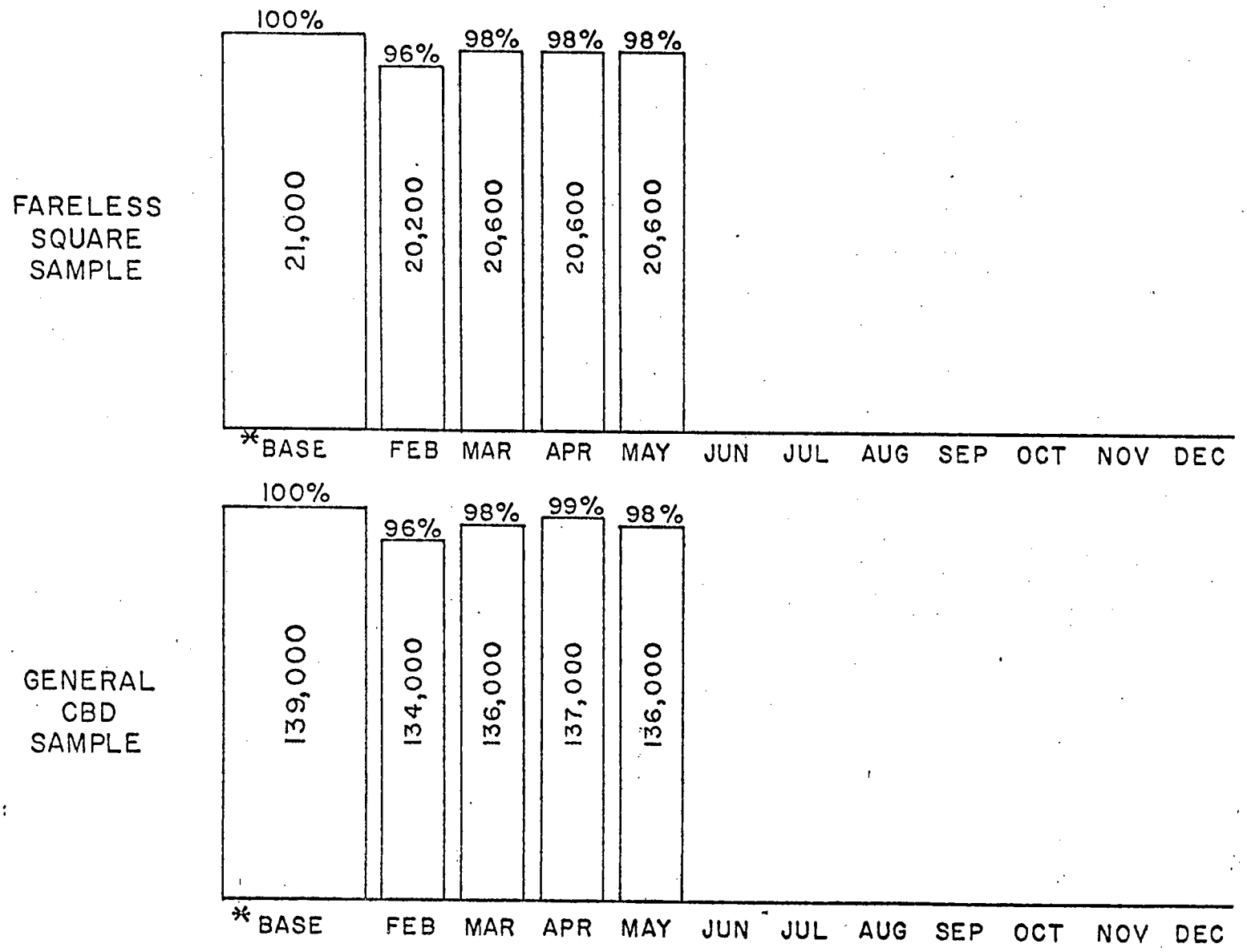
J. K. Wilson
Sr. Traffic Engineer

MT:la

Enclosure

TRAFFIC COUNTS FROM COMPUTER DETECTORS

*BASE PERIOD : NOVEMBER 1974 TO JANUARY 1975



Appendix E
Costs of Fareless Square

1.	"Name the Free Fare Zone" Contest (October-November, 1974) Bus Cards, Counter Cards, Ballot, Media	$ 5,281.21
2.	Fareless Square Promotion (January-February, 1975) Art, Production, Printing, Media	5,887.81
3.	Signing 200 signs at $4.55 each	910.00
	TOTAL	$12,079.02

It should be noted that Fareless Square service made possible the elimination of two "Shopper" buses, at an annual savings of approximately $22,000.

Appendix F

ACKNOWLEDGEMENTS

Consultants

Yaden/Associates assisted Tri-Met staff in the design of the questionnaires, the design of the sample procedure, and the analysis of the data from the first survey.

Johnson-Lenz computed the tabulations for the two surveys. They also assisted in the design of the second questionnaire, explained the results of the second survey to Tri-Met staff, and assisted in the preparation of the final report. Appendix B, Survey Methodology, was written in toto by Johnson-Lenz.

Tri-Met Staff

Twenty bus operators related their experiences with Fareless Square service and shared their opinions. They are:

Jerry Gerard
Donald Hanke
Jack Hasbrook
Dave Hubbard
Al Hunt
James Jackson
Roy LaVallee
James Perez
Terry Prohaska
Jack Reeves
Dale Robson
Jack Schrieber
Pat Smith
Steve Teters
Leo Thackeray
Virginia Youngdell
George Whitworth
L. O. Williams
Mike Wilson
Lyle Wolford

Members of the Planning, Marketing, and Contract Administration staffs handed out surveys on the buses. They are:

Bill Allen
Betty Barker
Gary Brentano
Pat Holbrook
Dave Kuehn
Mike Kyte
Al Lombardi
Coleen Nelson
Lana Nelson
Frank Ostrander
Kathy Pallari
Bob Post
Linda Powers
Norma Roland
Dennis Schutt
Sharon Smith
Bob Thomas
Dave Weitzel
Ira Winograd